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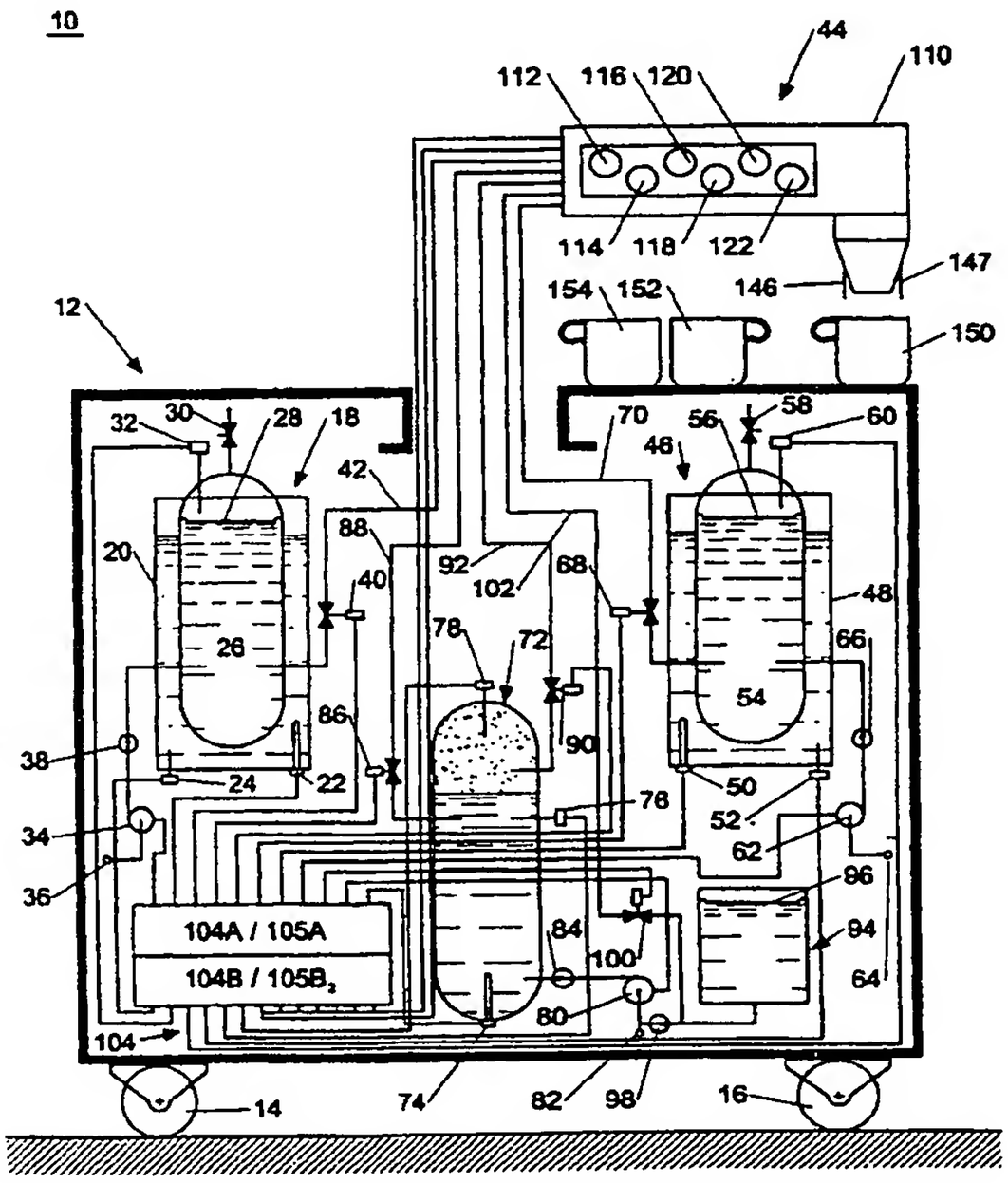

(57) Abstract: Apparatus for fast supply of coffee based infusions, or other beverages, comprising a trolley (12) which contains a pressurised and heated tank (18) for already prepared coffee, a pressurised and heated tank (46) for milk, a boiler (72) for preparing hot water and steam and a pressurised tank (94) for cold water. On the trolley (12) is mounted a supply gun (44) allowing to supply in cups (150, 152, 154) beverages in predetermined, or by the user wanted, quantities.

WO 01/74211 A1

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APPARARATUS FOR FAST SUPPLY OF COFFEE BASED INFUSIONS OR OTHER INFUSION BEVERAGES

The present invention relates to an apparatus for fast supply of coffee based infusions, or other infusion beverages, and, in particular, relates to an apparatus mounted on a trolley for said supply.

Presently, are more and more becoming popular bar-cafeteria services for industry, trade centres and to serve conferences, briefings, meetings, conventions, passengers of transport means and the like. One of the tasks of these services is to supply hot beverages, prepared in advance, together with various refreshments. If these services have to be spread in many rooms, it is convenient that they are provided by easily movable units, such as trolleys. Similarly, it would be useful to have supply counters, of self-service kind, provided with service means to be loaded in proper preparing rooms and to be inserted in the same supply counters.

To meet the above mentioned requirements, till now it has been devised to use particularly insulated vessels, such as "thermos" vessels or Dewar vessels, to store therein already prepared hot beverages, such as coffee, tea, milk and the like to be moved on properly equipped trolleys. However, the hot beverages stored in the thermos have the drawback of a slow but unavoidable temperature loss and are not suitable to supply those beverages appreciated by particularly demanding consumers, such as espresso coffees and cappuccinos, which, till now, needed extemporaneous preparation to be of satisfying quality. It has been thought to use heating means to maintain hot the beverages stored in the thermos, but such a measure proved to be just a palliative of the noticed drawbacks because was maintained a satisfying temperature of the beverages, but it was impossible to prevent their organoleptic decay due to long exposition to ambient pressure which is insufficient to prevent the loss of volatile components so important to preserve smells and tastes of hot beverages, especially coffee based beverages.

The applicant of the present application filed on May 6, 1998 the Italian patent application S. N. MI 98A 000974 disclosing an apparatus for fast supply of coffee based infusions, such as espresso coffee or cappuccino, comprising a first unit for preparing infusion doses (coffee) to be supplied, a second unit for temporary storage at controlled temperature and pressure of the so prepared

coffee, a third unit for temporary storage at controlled temperature and pressure of milk and a fourth unit for supplying single doses of coffee based beverages.

The apparatus disclosed in the above mentioned application comprised therein inserted a device for grinding and percolating roasted coffee, installed in the above mentioned first unit, and further provided to keep the coffee and the milk stored in the second and third unit at the same temperature, consisting the second and the third units of insulated tanks lined with jackets for circulating hot water coming from a boiler common for the whole apparatus.

Such an apparatus showed however a first drawback of exceeding encumbrance, due to the presence therein of the first unit comprising the device for grinding and percolating coffee, which encumbrance made very difficult to move the apparatus, and a second drawback connected to the fact that, by using to maintain at controlled temperatures both the coffee storage unit and the milk storage unit the same water from the common boiler, it was impossible to find ideal temperature conditions for both the coffee and the milk, because the best temperature for the storage of the coffee was not proper for the storage of the milk and vice versa.

At last, a third drawback was not to provide a supply means having incorporated so many push buttons as were the beverages to be selected so that the selection of the beverages was made on a control board placed far from the supply means.

Therefore, arose the need of a light apparatus of minimum encumbrance, either movable on wheels or fixed, to be connected to supply units of percolated coffee and milk, of electric power and drink water, to a fast local supply of so-called cafeteria hot beverages, such as : espresso coffee, so-called "American" long coffee, hot milk with foam, hot milk without foam, so-called "American" milk and coffee, and cappuccino.

The above mentioned need is met by an apparatus according to the invention comprising a first pressurised and thermostatic tank for already prepared coffee, second tanks pressurised and thermostatic for milk or other beverages, at least a boiler for providing hot water and steam and at least a unit for supplying the above listed beverages, characterized in that the pressurised and thermostatic

tanks are controlled by independent thermostats and the beverage supply unit is however near a control keyboard to supply the same beverages.

Preferably, the control keyboard is incorporated in the supply unit.

In addition, the supply unit is provided with a level sensor able to detect the level of the beverages poured in the cups and to emit a supply stop signal when the level of the beverages in the cups attains a pre-set or wanted magnitude.

Alternatively, instead of detecting the level of the beverages in the cups, it is possible to determine, either directly or indirectly the size of the cups to be filled and, from this size, to set the quantity of beverages to be supplied to the cups themselves.

The direct determination of the size of the cups can be carried out by means of detecting optical means.

The indirect determination of the size of the cups can be carried out through the reading of a proper marking imprinted on the cups.

The reading of the mark can be an optical reading of a bar code.

Alternatively, the reading can be a reading of a magnetic band imprinted on the cups.

In further alternative, the reading can come from an answer to a signal of a transponder sent to a circuit incorporated in the same cups.

In particular, the supply unit is in the form of a hand gun provided with a keyboard for supply control with so many keys as they are the beverages to be supplied.

Still more particularly, the keys of the keyboard are to control the supply of hot beverages so-called of cafeteria, that is:

- espresso coffee;
- so-called "American" long coffee;
- hot milk with foam;
- hot milk without foam;
- so-called "American" milk and coffee;
- cappuccino.

Of course, to the above listed beverages can be added hot tea, both alone and/or with milk.

Preferably the choice of the kind of beverage, the data regarding the size of the cups to be served, the data of the set quantities of beverages and of the actually supplied quantities are supplied to a microprocessor which enables the activation of electrovalves till the set quantities are attained and disables the activation of the same electrovalves when the set quantities are attained.

Alternatively, the selection of the kind of beverage and a signal of liquid level in a cup, determined by probes, are sent to a microprocessor which enables the activation of electrovalves till a wanted level of liquid in cup, determined by the probes, is attained.

The features of the present invention are defined in the appended claims forming the concluding portion of this description. However, other features and advantages of this invention will result from the detailed description of some embodiments, not to be considered in limiting sense, provided with the enclosed drawings, in which similar portions have been indicated by similar numerals and wherein:

- Figure 1 is a view diagrammatically depicting in cross-section a movable truck containing an apparatus according to a first embodiment of the present invention;
- Figure 2 is a view depicting in cross-section, in detail, a supply gun for serving an apparatus according to the first embodiment of the present invention;
- Figure 3 is an electric diagram of the control unit of a control and detection board of the apparatus according to the present invention;
- Figure 4 is an electric diagram of the detection section of the same control and detection board;
- Figure 5 is an electric diagram of a level sensor of beverage in a cup based on electric conduction between two electrodes;
- Figure 6 is a view diagrammatically depicting in cross-section a movable truck containing an apparatus according to a second embodiment of the present invention;

- Figure 7 is a view depicting in cross-section, in detail, a supply gun for serving an apparatus according to the second embodiment of the present invention;
- Figure 8 is an electric diagram of the control unit of a control and detection board of the apparatus of the second embodiment of the present invention;
- Figure 9 is an electric diagram of the detection section of the same control and detection board for a first approach of the second embodiment of the invention, using a microprocessor and an optical system to detect the size of the cups to be filled;
- Figure 10 is an electric diagram of the detecting section of the same control and detection board for a second approach of the second embodiment of the invention using a microprocessor and a level detection in a cup based on electric conduction in the liquid;
- Figure 11 is a flowchart of the procedures carried out in the detecting section made according to the first approach of the second embodiment of the invention using the optical system to detect cup size; and
- Figure 12 is a flowchart of the procedures carried out in the detecting section made according to the second approach of the second embodiment of the invention using the detecting level system based on electric conduction in the liquid.

Reference is made at first to figures 1 and 2. According to these two figures, an apparatus 10 according to the present invention comprises a movable truck 12 mounted on wheels 14 and 16 to be moved where it needs. The truck 12 contains a first pressurised tank 18, expected to contain coffee, comprising a heated external pool 20, provided with a heating resistor 22 and a thermostat 24, having the task to maintain steady the temperature of the pool 20. The pool 20 contains an autoclave 26 of the kind provided with a membrane 28 for the separation between liquid and gas, which in the lower portion contains coffee infusion, prepared outside the apparatus 10, and in the upper portion contains a gaseous atmosphere, such as compressed air, introduced through a valve 30. The pressure of this gaseous atmosphere depends from the level of the liquid present in the

autoclave 26 and acts on a manometer and pressure switch 32 providing information on the filling of the autoclave 26 itself.

The autoclave 26 is provided with coffee, prepared outside the apparatus 10, by means of a pump 34 receiving, through an input duct 36, the coffee coming from an external infusion set, which can be of the kind disclosed in the Italian patent application S. N. MI 99A 000416, filed on March 2, 1999 at the name of the applicant of the present application. The coffee, coming out from the pump 34, enters through a check valve 38 the autoclave itself, where it is stored and maintained at the temperature allowed by the thermostatic pool 20. A withdrawal duct, provided with a solenoid valve or electrovalve 40, allows to send, through a pipe or duct 42, the coffee to a supply gun 44, to be further disclosed in detail (from now on, the terms solenoid valve and electrovalve will be interchangeably used).

Further, the truck 12 contains a second pressurised tank 46, expected to contain milk, formed by an external heated pool 48, provided with a resistor heater 50 and a thermostat 52, having the task to maintain steady the temperature in the pool 48. The pool 48 contains an autoclave 54, of the kind provided with a membrane 56 for the separation between liquid and gas, which in the lower portion contains milk, coming from outside the apparatus 10, and in the upper portion contains a gaseous atmosphere, such as compressed air, introduced through a valve 58. The pressure of this gaseous atmosphere depends from the level of the liquid present in the autoclave 54 and acts on a manometer and pressure switch 60 providing information on the filling of the autoclave 54 itself.

The autoclave 54 is provided with milk by means of a pump 62 receiving, through an input duct 64, the milk coming from an external vessel. The milk, coming out from the pump 62, enters through a check valve 66 the autoclave 54 itself where it is stored and maintained at the temperature allowed by the thermostatic pool 48 and, owing to the high temperature, is sterilised. A withdrawal duct, provided with a solenoid valve 68, allows to send, through a pipe or duct 70, the hot milk to the same supply gun 44.

The truck 12 contains also a boiler 72, producing hot water and steam, which is provided with a resistor heater 74, a thermostat 76 and a pressure switch 78. A

pump 80, controlled by the pressure switch 78, supplies water from an external source 82, such as a drinking water pipe network, to the boiler 72 through a check valve 84. A first solenoid valve 86 withdraws hot water from the boiler 72 and sends it, through a pipe 88, to the supply gun 44. A second solenoid valve 90 withdraws steam from the boiler 72 and sends it, through a pipe 92, to the supply gun 44.

Also in the truck 12 there is a pressurised tank 94 for cold water of the autoclave kind provided with a membrane 96 which is time-by-time provided by the drinking water pipe network 82 through a check valve 98 and can supply cold water through a solenoid valve 100 and a pipe 102 to the supply gun 44. It is to notice that instead of the water pipe network 82 there were a simple water tank at atmospheric pressure, it would be logical to provide with the check valve 98 a pump without coming out from the scope of the present invention.

All the signals detected by thermostats, pressure switches and the like are sent to a control and detection board 104, which for a matter of easy description, is divided in two sections, a control section 104A and a detection section 104B. The above mentioned board will be disclosed in more detail in the following figures 3 and 4.

Let us consider particularly figure 2 depicting in detail the supply gun 44, already generally shown in figure 1. Such a supply gun 44 consists of a handle 110 having some push-buttons 112 to 12, anyone corresponding to a different kind of beverage to be supplied. For example, the push-button 112 is the button controlling the supply of espresso coffee, the push-button 114 controls the supply of the so-called "American" coffee, the push-button 116 controls the supply of hot milk with foam, the push-button 118 controls the supply of hot milk without foam, the push-button 120 controls the supply of the so-called "American" "American" milk and coffee and the push-button 122 controls the supply of cappuccino.

To the handle 110 is connected a supply head 124, of plastic material for food and resistant to the here met high temperatures, comprising a plurality of internal coaxial ducts exiting in an output chamber 126. The plurality of coaxial ducts consists of a first internal duct 70A, connected to the pipe 70 of the hot milk,

ending with a nozzle 70B, surrounded by a second pipe 128, continued in a duct 130, connected to a solenoid valve 132, in turn connected to the external atmosphere through a dust- stopping air-filter 134, and a duct 136. Around the second pipe 128 is arranged a third coaxial pipe 138 connected to the pipe 42 of the hot coffee. Around the third pipe 138 is arranged a fourth coaxial pipe 140 connected to the pipe 92 of the steam and the fourth pipe 140 is connected to the output chamber itself 126 in which enter the pipe 88 of the hot water and the pipe 102 of the cold water.

Inside the handle 110 is housed a level sensor 142, of high frequency resistive kind, which by means of a coaxial cable 144 couples a signal to a first probe 146 and a second probe 147 detecting liquid level in a cup by conduction. The level sensor 142, according to the detected liquid level, emits on an output S thereof a continuous high or low signal to which corresponds an enabling signal for supplying beverages, as defined by the following Table 1 in which the logic level "1" stands for indicating supply enable and the logic level "0" stands for indicating supply disable, being the signal S low (L) for enabled supply and high (H) for disable supply. Of course, the signal S can be logically inverted, if that would be convenient.

TABLE 1

Supply enable controlled by liquid level in the cup

LEVEL IN THE CUP	SIGNAL S	ENABLE
LOW (L)	L	1
HIGH (H)	H	0

Looking again at figure 2, it is seen that the push-buttons 112 to 122 are connected, on a side, to a common wire indicate by the symbol "C-" and, on another side, to corresponding signal wires 112A to 122A. Further, the solenoid valve 132 is connectedto the control wires 132A and 132B, which together with the signal wires 112A to 122A, are connected to the detection and control board 104. In particular, the wires C-, and 112A to 122A are connected to the control section 104a of the board 104.

The beverages to be obtained from the apparatus according to the present invention are the following ones:

1) Espresso coffee;
2) So-called "American" long coffee;
3) Hot milk with foam;
4) Hot milk without foam;
5) So-called "American" ilk an coffee, and
6) Cappuccino

To obtain the espresso coffee, the push-button 112 of the supply gun 44 is pressed, pouring in one of the cups 150 to 154 (in particular in the small cup 150) hot coffee, coming from the autoclave 26, with steam coming from the boiler 72 and providing to mix the coffee with the steam to allow foam production on the surface of the coffee in the cup 150. To this purpose must be open the solenoid valves 40 and 90 till the level in the cup 150 attains the desired height, causing the automatic stopping of the apparatus by general disable of all the solenoid valves.

To obtain the so-called "American" long coffee, the push-button 114 of the supply gun 44 is pressed, pouring in one of the cups 152 or 154 hot coffee, coming from the autoclave 26, with hot water, coming from the boiler 72, and possibly cold water, coming from the pressurised tank 94, to attain the desired coffee temperature. To this purpose must be open the solenoid valve 40, the solenoid valve 86 and, possibly, the solenoid valve 100 till the reaching of the wanted level in the cup 152 or 154 disables all the solenoid valves or electrovalves.

To obtain hot milk with foam, the push-button 116 of the supply gun is pressed, pouring in one of the cups 152 or 154 hot milk, coming from the autoclave 54, and ambient air drawn at level of the supply gun 44. To this purpose must be open the solenoid valve 68 of the hot milk and the solenoid valve 132 of the air, so that the hot milk coming out of the nozzle 70B, draws ambient air to produce foam in the milk.

To obtain hot milk without foam the push-button 118 of the supply gun 44 is pressed, pouring in one of the cups 152 or 154, just hot milk coming from the autoclave 54. To this purpose just the solenoid valve 68 remains open.

To obtain so-called "American" milk and coffee, the push-button 120 of the supply gun 44 is pressed, pouring in one of the cups 152 or 154 hot coffee and

milk. To this purpose will be open the solenoid valve 40 of the coffee and the solenoid valve 68 of the hot milk.

To obtain cappuccino the push-button 122 of the supply gun 44 is pressed, pouring in one of the cups 152 or 154, hot coffee, steam, hot milk and air together. To this purpose will be open the solenoid valves 40, 90, 68 and 132 to supply together coffee, steam, hot milk and air.

The different kinds of beverages here above mentioned are composed as here above explained and as listed in the enclosed table 2 in which the logic symbol "1" indicates the presence of a specific ingredient and the logic symbol "0" indicates the absence of the ingredient.

Of course, the presence of every ingredient corresponds to the activation of the corresponding solenoid valve providing to the supply.

TABLE 2

Ingredients of the supplied beverages and corresponding enregised valves (Vs)

Beverage to be supplied	**Push-button to be pressed**	**Coffee** (Vs 40)	**Hot water** (Vs 86)	**Steam** (Vs 90)	**Cold water** (Vs 100)	**Hot milk** (Vs 68)	**Air** (Vs 132)
1) Espresso coffee	112	1	0	1	0	0	0
2) American coffee	114	1	1	0	1/0	0	0
3) Hot milk + foam	116	0	0	0	0	1	1
4) Hot milk without foam	118	0	0	0	0	1	0
5) American milk and coffee	120	1	0	0	0	1	0
6) Cappuccino	122	1	0	1	0	1	1

Let us consider the figures 3 and 4 for a complete description of the control and detection board serving the apparatus 10.

Looking at figure 3, it is seen that the control section 104A of the board 104 comprises a connection to an electric main power formed by a phase line L, a neutral line N and a ground connection G. The lines L and N are connected to a general circuit breaker 160 to which are, in turn, connected two lines L_A and N_A for general power supply of devices, a lamp 161 for signalling main voltage and a primary winding 162 of a voltage reducing transformer 164 supplying low voltage (for example 24 Volts) from a secondary winding 166 thereof which preferably is

of the kind provided with centre tap 168 (12 + 12 Volts) for particular safety reasons of the devices served by this secondary winding 166. To the two ends of the secondary winding 166 are connected two rectifying diodes 170 and 172 supplying a rectified voltage to a first levelling capacitor 174 and to a line $+V_B$ supplying DC loads, as well as a voltage reducing and stabiliser device 176 followed by a second levelling capacitor 178 to obtain a DC (+) for the power supply or electronic circuits, such as the level sensor depicted in the figure 2.

It is to notice that at the output of the two rectifier diodes 170 and 172 could be connected a chargeable battery able to maintain the voltage $+V_B$ to supply both the relays and the solenoid valves even if the truck 10 were disconnected from any power main. Of course, the chargeable battery would be connected to enregise just the solenoid valves and not the pumps and the resistor heaters which do not need to be continuously powered.

The same secondary 166 is also connected to two lines 180 and 182 and specifically directly to the line 180 and through a normally closed relay contact 184 to the line 182 to carry out the cup level control function, as will be here below explained in more detail.

Looking at the board section 104A from left to right, having in mind also the figure 1, it is seen that a motor 34M of the coffee pump 34 is connected, through a pair of relay contacts C_{34}, to the power supply line L_A, the heater 22 of the heated pool 20 is also connected through a pair of relay contacts C_{22}, to the power supply line L_A, the solenoid valve 40 for supplying hot coffee is connected, on a side, directly to the first low voltage line 180 and, through a pair of relay contacts C_{40}, to the second low voltage line 182. Similarly, the solenoid valve 86 to supply hot water is connected, on a side, directly to the first low voltage line 180 and, through a pair of relay contacts C_{86}, to the low voltage line 182. The same happens for the solenoid valve 90 to supply steam, which is controlled by a pair of relay contacts C_{90} and for the respective solenoid valves 68 to supply hot milk, 100 to supply cold water and 132 for air suction, which are controlled by respective pairs of relay contacts C_{68}, C_{100} and C_{132}.

The heater 50 of the heated pool 48 for the milk tank 46 is connected to the supply line L_A through pair of relay contacts C_{50}. A motor 62M of the milk supply

pumps 62 is also connected to the power supply line L_A through a pair of relay contacts C_{62}. A motor 80M of the pump 80, supplying water to the boiler 72, is connected to the power supply line L_A through a pair of relay contacts C_{72} and the heater 74 of the boiler 72 is connected to the power supply line L_A through a pair of relay contacts C_{74}.

As visible in the lower portion of figure 3, a relay coil 184_R, controlling the contact pair 184, is in turn controlled by a NPN transistor 184_T whose base, as here below explained, is controlled by a signal S coming from the level sensor 142 depicted in figure 2 and, more in detail in figure 5.

Let us now consider in detail figure 4 depicting the detection section 104B of the same control and detection board 104.

Looking with figure 3 also figure 4 from left to right, it is seen that a wire pair 180 and 186, which result as connected to the secondary winding 166 of the transformer 164, supplies power to the coils of AC relays R_{34}, R_{22}, R_{62}, R_{50}, R_{80} and R_{74}.

The numeral 32 indicates the pressure switch of the autoclave 26 of the hot coffee, which when closes the contacts, turns on a warning lamp L_{34}, so that, when the truck is connected to a coffee percolator and to a power main, by pressing a push-button 33, is enregised a relay coil R_{34}, closing the contact pair C_{34} connecting the pump motor 34M to the power main conductor L_A, allowing the pump 34 to supply fresh coffee, just prepared, to the autoclave 26.

The numeral 24 indicates the thermostat of the heated pool 20 of the autoclave 26 of the hot coffee which, when closes the contacts, enregises the relay coil R_{22}, closing the contact pair C_{22} connecting the heater 22 to the power main conductor L_A, so allowing the heater 22 to maintain a temperature in the autoclave 26 to the desired value, when the truck is connected to the power main.

The numeral 60 indicates the pressure switch of the autoclave 54 of the hot milk which, when closes the contacts, turns on a warning lamp L_{62}, so that when the truck is connected to a milk container and the power main, by pressing a push-button 51, the relay coil R_{62}, closing its contact pair C_{62} connecting the motor 62M of the pump 62 to the power main conductor L_A, so allowing the pump 62 to supply milk to the autoclave 54.

The numeral 52 indicates the thermostat of the heated pool 48 of the autoclave 54 of the hot milk which, when closes the contacts energise the relay coil R_{50}, closing the contact pair C_{50} connecting the heater 50 to the power main conductor L_A, allowing the heater to maintain the temperature of the autoclave 54 at the desired value, when the truck, or an equivalent, is connected to the power supply main.

The numeral 78 indicates the pressure switch of the boiler 72 for hot water and steam which, when closes the contacts, turns a warning lamp L_{80} on, so that when the truck is connected to the water supply piping 82 and the power main, by pressing a pus-button 79, the relay coil R_{80} is energised, closing the contact pair C_{80} connecting the pump motor 80M the power main conductor L_A, allowing the pump 80 to supply drink water from the water supply piping 82 to the boiler 72.

The numeral 76 indicates the thermostat of the same boiler 72 which, when closes the contacts, energises the relay coil R_{74}, closing the contact pair C_{74} connecting the heater 74 to the power main conductor L_A, so allowing the heater 74 to maintain the temperature of the boiler 72 at the desired value, when the truck, or an equivalent is connected to the power supply main.

Still looking at the figures 3 and 4, it is seen that the wire $+V_B$ is connected to the respective DC relay coils R_{40}, R_{86}, R_{90}, R_{100}, R_{68} and R_{132}. It is to notice that anyone of the above mentioned relays is connected, through diodes, to one of the conductors 112A to 122A which in the supply gun 44, depicted in the figure 2, are connected to the contacts of the push-buttons 112 to 122, which are to ask for the many kinds of desired beverages.

As it is seen in figure 2, when is pressed the push-button 112, corresponding to espresso coffee, the wire 112A is connected to the common wire C- and through the diodes 40_A and 90_A are energised the relay coils R_{40} and R_{90}, respectively, so closing the respective contact pairs C_{40} and C_{90} controlling the electrovalves 40 and 90, which supply hot coffee and steam, respectively, to the supply gun 44.

Similarly, when is pressed the push-button 114 corresponding to the so-called "American" coffee, the wire 114A is connected to the common wire C- and then are energised through the diode 40_B the relay coil R_{40} and directly at least the

relay coil R_{86} to cause the closure of the respective contact pairs C_{40} of the electrovalve 40 of the hot coffee and C_{86} of the electrovalve 86 of the hot water supplying hot coffee and hot water to the supply gun 44. In addition, it is possible to choose to prepare a lukewarm "American" coffee, getting in touch a movable contact 100_A against a fixed contact 100_B connected to the relay coil R_{100}, in order to close also the contact pair C_{100} and energise the electrovalve 100 to supply also cold water to the supply gun 44 with coffee and hot water.

When is pressed the push-button 116, corresponding to hot milk with foam, the wire 116A is connected to the common wire C- and so, through the diodes 68_A and 132_A, are energised the relay coils R_{68} and R_{132}, respectively, closing the respective contact pairs C_{68} and C_{132} controlling the electrovalves 68 and 132, which supply hot milk and air to the supply gun 44.

When is pressed the push-button 118, corresponding to hot milk without foam, the wire 118A is connected to the common wire C- and so, through the diode 68_B is energised the relay coil R_{68}, closing the contact pair C_{68} which controls the electrovalve 68 supplying hot milk to the supply gun 44.

When is pressed the push-button 120, corresponding to the so-called "American" milk and coffee, the wire 120A is connected to the common wire C- and so, through the diodes 40_C and 68_C, are energised the relay coils R_{40} and R_{68}, respectively, closing the respective contact pairs C_{40} and C_{68} controlling the electrovalves 40 and 68, which supply both hot coffee and hot milk to the supply gun 44.

At last, when is pressed the push-button 122, corresponding to cappuccino, the wire 122A is connected to the common wire C- and so, through the diodes 40_D, 90_B, 68_D and 132_B, are energised the relay coils R_{40}, R_{90}, R_{68} and R_{132}, respectively, closing the respective contact pairs C_{40}, C_{90}, C_{68} and C_{132} controlling the electrovalves 40, 90, 68 and 132, which supply hot coffee, steam, hot milk and air to the supply gun 44 for the preparation of a cappuccino.

Considering in a time the figures 2, 3 and 4, it is possible to completely understand the operation of the level sensor 142 and the associated relay controlling the power supply to the electrovalves. Starting from figure 2, it is seen that the level sensor 142, which is a high frequency activated detector, as a

conduction detector consisting of two metal pins operating when the pins graze the surface of the liquid in the cup, emits an output signal S which, in the present embodiment, is low, that is near the DC voltage (-), till the liquid level in the cup is under a preset value for full cup and becomes high, that is near the DC voltage (+), when the liquid level in the cup is over the preset value for full cup. The signal of the output S is coupled through a resistor 190, limiting the current to the base of the transistor 184_T, depicted in figure 3, so that, when the signal S is low, the transistor 184_T is disabled, the relay coil 184_R is de-energised and the contact pair 184 is closed, permitting the connection of the line 182 to the secondary winding 166 of the transformer 164 and then the possibility of energising all the electrovalves. On the contrary, when the signal S is high, the transistor 184_T is saturated, the relay coil 184_R is energised and the contact pair 184 is open, interrupting the connection of the line 182 to the secondary winding 166 of the transformer 164 and preventing any energisation of all the electrovalves.

Let us consider figure 5 depicting a detailed electric diagram of a detector 142 of beverage level in a cup using electric conduction in a liquid.

As it is well known from the electrochemistry that, to avoid electrolytic decomposition in a liquid crossed by an electric current, must be used an alternating current having frequency of at least 1 KHz, because at such a frequency, and higher frequencies, possible ions in the liquid cannot migrate for a time long enough to allow the occurrence of chemical reactions, it is sufficient to supply two electrodes which can be two probes 146 and 147, as two rods of relatively unalterable metal, such as stainless steel or chromed brass, with an alternating current of proper frequency, 10 KHz for example, to sharply signal the attaining of the level for intending a full cup. In fact, when the level of the beverage touches the two probes 146 and 147, a path between them, having resistance of 100 Kohm or less, is established, so that it is possible to send an AC signal of the above mentioned frequency, provided by a suitable electronic generator of any kind well known in the art, to a detector producing a high signal any time the level of the beverage in the cup touches the two probes 146 and 147.

To this purpose a particular beverage level sensor 142 employs for the generation of a 10 KHz signal a square wave generator 190 using an integrated

circuit 192, known to those skilled in the art as "Timer 555", connected in the configuration of astable multivibrator, in which two resistors 194 and 196 and a capacitor 198 set the oscillation frequency at about 10 KHz (for example, to have the above mentioned frequency the resistor 194 can have a resistance of 1 KOhm, the resistor 196 can have a resistance of 4.7 KOhm and the capacitor 198 can have capacitance of 12 nF). The generator 190 produces at the pin 3 of the integrated circuit 192 a square wave signal oscillating between zero voltage and a voltage substantially equal to the supply voltage - usually +5 Volt a voltage broadly employed in electronic circuits using microprocessors. By means of a capacitor 200 just the alternating component of the voltage emitted by the pin 3 (variable between –2.5 Volt and +2.5 Volt) is coupled to a primary winding 202 of a first transformer 204 having a secondary winding 206 to cause a proper voltage raise at its ends (for example the turn ratio between the primary winding 202 and the secondary winding 206 can be 1:20). The signal from the secondary winding of the transformer 204 is coupled to a circuit comprised of the series connection of a primary winding 208 of a second transformer 210 and a resistor 212 equivalent to the presence of a beverage between the probes 146 and 147. The transformer 210 has a secondary winding 214 at whose ends is formed a voltage any time the primary circuit is completed through the equivalent resistor 212 (the turn ratio between the primary winding 208 and the secondary winding 214 can be 5:1 to assure at the secondary a current five times higher than the current in the primary winding 208). The signal at the secondary winding 214 is rectified by a bridge rectifier 216, levelled by a capacitor 218 and discriminated by a diode 220 operating as a threshold member to prevent unwanted operations due to parasitic capacitance or humidity in traces between the probes 146 and 147. The signal at the output of the diode 210 can be used either directly as a signal S to be coupled to the base of the transistor 184_T energising the relay 184_R to deactivate all the solenod valves, or be inverted, as a signal S', by an inverter circuit formed by a NPN transistor 222, by a base resistor 224 and a collector resistor 226.

Let us consider the figures 6 and 7 depicting a second embodiment of the apparatus according to the invention and its supply gun 44a, respectively.

According to this second embodiment of the invention, an apparatus 10a is substantially made as the apparatus 10 of the first embodiment with the differences of having a supply gun 44a without level probes 146 and 147, and provide to the support tray of the cups 150-154 two shape optical detectors 230 and 232 comprised of light emitting diodes (LED) 234, 236 and 238 on a side and phototransistors 240, 242 and 244 on another side, on the pipe 42 of the coffee a flow-meter 43 emitting pulse signals 43A, on the pipe 70 of the milk a flow-meter 71 emitting pulse signals 71A, on the pipe 88 of the hot water a flow-meter 89 emitting pulse signals 89A and on the pipe 102 of the cold water a flow-meter 103 emitting pulse signals 103A and provide instead of the control and detection board 104, of substantially electromechanical kind, a board 105 having a control section 105A substantially similar to the control section 104A of the board 104 and a detection section $105B_1$ implemented by means of a microprocessor. The signals of the above mentioned flow-meters 43, 71, 89 and 103 give information on the supplied liquid quantities from which the microprocessor of the board section $105B_1$ decides whether continuing or stopping any liquid supply.

Let us consider figure 7 depicting in detail the supply gun 44a. This supply gun 44a is similar to the supply gun 44 depicted in figure 2, but is simpler because does not contain any level sensor in the handle 110a and the supply head 124a is internally simpler than the supply head 124 of the gun 44 because the output chamber 126 contains just one ejector formed by the inner pipe 70A terminating in the nozzle 70B surrounded by a second pipe 128 continued in the duct 130 connected to the electrovalve 132 receiving air through a filter 134 from the duct 136 open to the atmosphere. The ejector allows to produce foamy hot milk by air suction caused by milk flow in the inner pipe 70A and by the opening of the electrovalve 132.

Into the output chamber 126 get also the respective ducts 42 of hot coffee, 88 of hot water, 92 of steam and 102 of cold water.

The push-buttons 112 to 122 have the same functions of the corresponding push-buttons of the gun 44 depicted in figure 2, so that reference is made to that figure without further disclosing these functions.

Let us consider figure 8 depicting the control section 105A of the control and detection board 105 depicted in figure 6.

Such a control section 105A is similar to the control section 104A depicted in figure 3, to which reference is made, with the difference that are lacking the relay contact pair 184, the relay coil 184_R and the transistor 184_T controlled by the level sensor 142 of the figures 2 and 5, and that the voltage (+) from the voltage reducing and stabilising device 176 is suited to supply microprocessors (for example +5 Volt).

Let us consider figure 9 depicting an electric diagram of a first approach of detection section $105B_1$ of a control and detection board 105 provided with a microprocessor. Such detection section $105B_1$ has an electromechanical portion, consisting of the controls 32, 24, 60, 52, 78 and 76 of thermostats and pressure switches, exactly as depicted in both the embodiments of figure 1 and figure 6, and of the relay coils R_{34}, R_{22}, R_{62}, R_{50}, R_{80} and R_{74}, identical to figure 4, to which reference is made, but is different because has a microprocessor 250_1 comprising an input 251, in form of a serial gate, of data necessary to determine the beverages to be supplied (times, quantities, etc. ...), a central processing unit (CPU) 252, a non-volatile memory (EEPROM or FLASH) 254 and an input/output port (I/O) 256. The CPU 252 receives from the input 251 data for determining the beverages having to be prepared, as for example:

1) for espresso coffee: so many cm^3 of hot coffee + steam;
2) for long "American" coffee: so many cm^3 of hot coffee + so many cm^3 of hot water + possible so many cm^3 of cold water, according to the desires;
3) for hot milk with foam: so many cm^3 of hot milk + sucked air;
4) for hot milk without foam: so many cm^3 of hot milk;
5) for "American" milk and coffee: so many cm^3 of hot milk + so many cm^3 of hot coffee;
6) for cappuccino: so many cm^3 of hot coffee + steam + plus so many cm^3 of hot milk + sucked air.

Those data are collected by the CPU 252 and stored in the non-volatile memory 254.

Subsequently, when one of the push-buttons 112 to 122 is pressed, one of the above listed beverages is ordered and, at the same time, from the optical detectors, comprising the light emitting diodes 234 to 238 and the phototransistors 240 to 244, are received data determining the size of the vessels to be filled and from the outputs 43A, 71A, 89A and 103A are received data from the flow-meters 43, 71, 89 and 103 regarding the volumes of the liquids flowing in the ducts 42, 70, 88 and 102 to the supply gun 44a. The requests of the kind of beverage, the size of the vessels to be filled and the total volume of flown liquids are sent through the I/O port 256 to the CPU 252. By the received data, the outputs from the I/O port 256 control the bases of the transistors T_{40}, T_{86}, T_{90}, T_{100}, T_{68} and T_{132} to energise the relay coils R_{40}, R_{86}, R_{90}, R_{100}, R_{68} and R_{132} controlling the activation of the respective electrovalves 40, 86, 90, 100, 68 and 132 in order to obtain the desired beverages in the volumes determined by the size of the vessels, such as the cups 150, 152 and 154.

Let us consider the figure 10 depicting an electric diagram of a second approach of detection section $105B_2$ of the control and detection board 105 provided with microprocessor 250_2.

This second approach has recourse to the apparatus depicted in figure 1, to the supply gun 44 in figure 2 provided with the level sensor 142, depicted in figure 5, and to a board 105, comprising the control section 105A and the detection section $105B_2$, instead of the electromechanical board 104. According to this solution, the connection and the software of the microprocessor 250_2 result well simpler. In fact, into the I/O port 256 come the connections 112A to 122A of the push-buttons designating the beverages and a signal S' coming from the output S' of the circuit 142 depicted in figure 5. The microprocessor 252_2 takes into account the signals 112A to 122A to choose the kind of beverage and allows the supply thereof till the signal on the connection S' is high and interrupts the supply, resetting all the control outputs to the transistors T_{40}, T_{86}, T_{90}, T_{100}, T_{68} and T_{132} when the signal S' becomes low indicating that the liquid level in the cup reached the detecting probes 146 and 147. Of course, it would be possible to use a logically inverse signal S which is low before the liquid touches the probes 146 and 147 and is high after having touched them.

The procedures carried in the microprocessors 250_1 and 250_2 depicted in figures 9 and 10 are depicted in the flowcharts of figures 11 and 12, respectively.

The flowchart of figure 11 starts from a decision block 270 asking if there is a supply request of some beverage (which can exist only if one of the push-buttons 112 to 122 has been pressed). If the answer is NO, the procedure comes back on itself and does not activate any supply valve. If the answer is YES, a block 272 collects the data for recognition of a cup, for the activated push-button corresponding to a given beverage, and emits a starting supply signal to energise valves, as indicated in the here above mentioned Table 2.

A subsequent decision block 274 compares the scheduled liquid quantities, connected to the recognition of cups and the supplied liquid quantities actually resulting from the summation of the pulse signals 43A, 71A, 89A and 103A coming from the flow-meters 43, 71, 89 and 103. If the quantities are not equal (answer NO), the procedure comes back to the block 272 to continue the supply. If the quantities are equal (answer YES), the procedure goes on to an action block 276 stopping the beverage supply and disabling the activators (for example by interdiction of the transistors T_{40}, T_{86}, T_{90}, T_{100}, T_{68} and T_{132} energising the electrovalves 40, 86, 90, 100, 68 and 132). The procedure then comes back to the decision block 270 where it stays till a subsequent supply request for a beverage is received.

The flowchart of figure 12 also starts from a decision block 270 asking if there is a supply request. If the answer is NO, the procedure comes back on itself and none supply valve is activated. If the answer is YES, a block 282 provides to energise the electrovalves corresponding to the required beverage, as indicated in Table 2. A subsequent decision block 284 asks if the liquid level in cup is high (that occurs when the liquid touches the probes 146 and 147 of the level sensor 142, as indicated in the figures 2 and 5). If the answer is NO, the supply is continued. If the answer is YES, the supply is stopped and the respective activated valves are deactivated as indicated by the action block 276.

The procedure comes back to the decision block 270 where waits for subsequent supply requests.

What has been here above disclosed depicts an embodiment of the invention not to be considered as limiting at all. So that people skilled in this art can devise from the reading of the above disclosure logically alternative and equivalent approaches to be deemed covered by the scope of the appended claims.

For example, to the heated tanks 18 and 46 for coffee and milk, respectively, can be logically added a further heated tank containing tea infusions to be supplied either alone or in addition to hot milk and, consequently, till two push-buttons should be added to one of the supply guns 44 or 44a to obtain supply of either tea alone or tea with milk, respectively.

The logical systems and their philosophy, embodied either by relays or by an electronic microprocessor should have to be consequently modified, in a way clearly self-evident to any person skilled in this art having read the above detailed disclosure of embodiments.

Also, the relays defined by the contact pairs C34, C22, C50, C62, C80 and C74 and by the coils could be omitted by directly controlling through the pressure switches 32, 60 and 78 the pump motors 34M, 62M and 80M and through the thermostats 24, 52 and 76 the heating resistors 22, 50 and 74. Also the DC relays could by inversely supplied, the transistor 184_T could be of PNP kind and the output signal S of the level sensor 142 could be logically inverted, as already mentioned, without go outside the scope of the invention.

Also, it would be possible to replace one of the here above indicated microprocessors 250_1 and 250_2 with different microprocessors. Further, it could be possible to use instead of the optical shape detectors 230 and 232, laser optical detectors able to read line bands draft on the cups or magnetic band detectors, or transponders as readers of electromagnetic circuits incorporated in the cups, any reading corresponding to a specific kind of cup.

Also the heating and supplying of the many heated and pressurised tanks could be made completely automatic by connecting their thermostats and pressure switches to a general control microprocessor for the apparatus, which could be one of the microprocessors 250_1 or 250_2 here above disclosed and depicted, which should provide to indicate on a suitable display the needs of the tanks and to

activate heating resistors and supply pumps when connected to devices supplying the beverages.

CLAIMS

1. Apparatus for fast supply of coffee based infusions comprising a first pressurised and heated tank (18) for already prepared coffee, second pressurised and heated tanks (46) for milk or other beverages to be maintained hot, at least a boiler (72) for generating hot water and steam and at least one beverage supply unit (44), characterized in that the pressurised and heated tanks (18, 46) are controlled by independent thermostats (24, 52) and the at least one supply unit (44) is however immediately near a control keyboard for the supply of the same beverages.
2. Apparatus, as in claim 1, characterized in that the supply controlling keyboard is incorporated in the beverage supply unit (44).
3. Apparatus, as in claim 1 or 2, characterized in that the beverage supply unit (44) is provided with a level sensor (142) able to sense the level of the beverages poured in served cups (150, 152, 154) and to give a signal (S) stopping the supply when the level of the beverages in the cups (150, 152, 154) attains a wanted height.
4. Apparatus, as in claim 3, characterized in that the supply unit is in the form of a hand grasped gun (44) provided with a supply controlling keyboard with so many keys (112 to 122) as are the beverages to be supplied.
5. Apparatus, as in claim 4, characterized in that the keys (112 to 122) of the keyboard are to control the supply of so-called cafeteria hot beverages, that is:
   - espresso coffee controlled by the first key (112),
   - so-called "American" long coffee controlled by the second key (114),
   - hot milk with foam controlled by the third key (116),
   - hot milk without foam controlled by the fourth key (118),
   - so-called "American" milk and coffee controlled by the fifth key (120), and
   - cappuccino controlled by the sixth key (122).
6. Apparatus as in preceding claims, characterized in that the gun (44) comprises a supply head (124) having an output chamber (126) in which meet a hot milk

pipe (70), an air duct (130), a hot coffee pipe (42), a steam pipe (92), a hot water pipe (88) and a cold water pipe (102).

7. Apparatus, as in claim 6, characterized in that in the output chamber (126) of the supply head (124) is present a plurality of coaxial ducts comprising a first inner duct (70A), connected to the hot milk pipe (70), and ending with a nozzle (70B), surrounded by a second pipe (128) continued in the air duct (130) connected to an electrovalve (132) opening to the ambient air.

8. Apparatus, as in claim 7, characterizzed in that the air electrovalve (132) is connected to the ambient air through a duct (136) and a dust arresting air-filter (134).

9. Apparatus, as in claims 7 and 8, characterized in that around the second pipe (128) is co-axially arranged a third pipe (138) connected to the hot coffee pipe (42) and around the third pipe (138) is co-axially arranged a fourth pipe (140) connected to the steam pipe (92).

10. Apparatus, as in claim 9, characterized in that the fourth pipe (142) is inner and co-axial with respect to the output chamber (126) housing the pipe (88) of the hot water and the pipe (102) of the cold water.

11. Apparatus, as in claims 2, 5 and 7, characterized in that instead of detecting the level of beverages in the cups the size of the cups is determined and from this size the quantities of beverages to be supplied to the cups are set.

12. Apparatus, as in claim 11, characterized in that the size determination of the cups is made by sensing optical means (230, 232) consisting of light emitting diodes (234, 236, 238) and phototransistors (240, 242, 244).

13. Apparatus, as in claim 11, characterized in that the size determination of the cups is made through the reading of a mark printed on the cups.

14. Apparatus, as in claim 13, characterized in that the reading of the mark is an optical reading of bar code.

15. Apparatus, as in claim 13, characterized in that the reading of the mark is a reading of a magnetic band printed on the cups.

16. Apparatus, as in claim 13, characterized in that the reading of the mark comes from the response to a signal of a transponder sent to a circuit incorporated in the cups themselves.

17. Apparatus, as in claim 11, characterized in that the choose of the kind of beverages, the determination of the size of the cups to be served, the set quantities of beverages and the actually supplied quantities, as determined by flow-meters (43, 71, 89 and 103), are sent to a microprocessor (250_1) enabling the activation of electrovlaves (40, 86, 90, 100, 68 and 132) before attaining the pre-set beverage quantities and disabling the same electrovalves (40, 86, 90, 100, 68 and 132) when the pre-set quantities are attained.

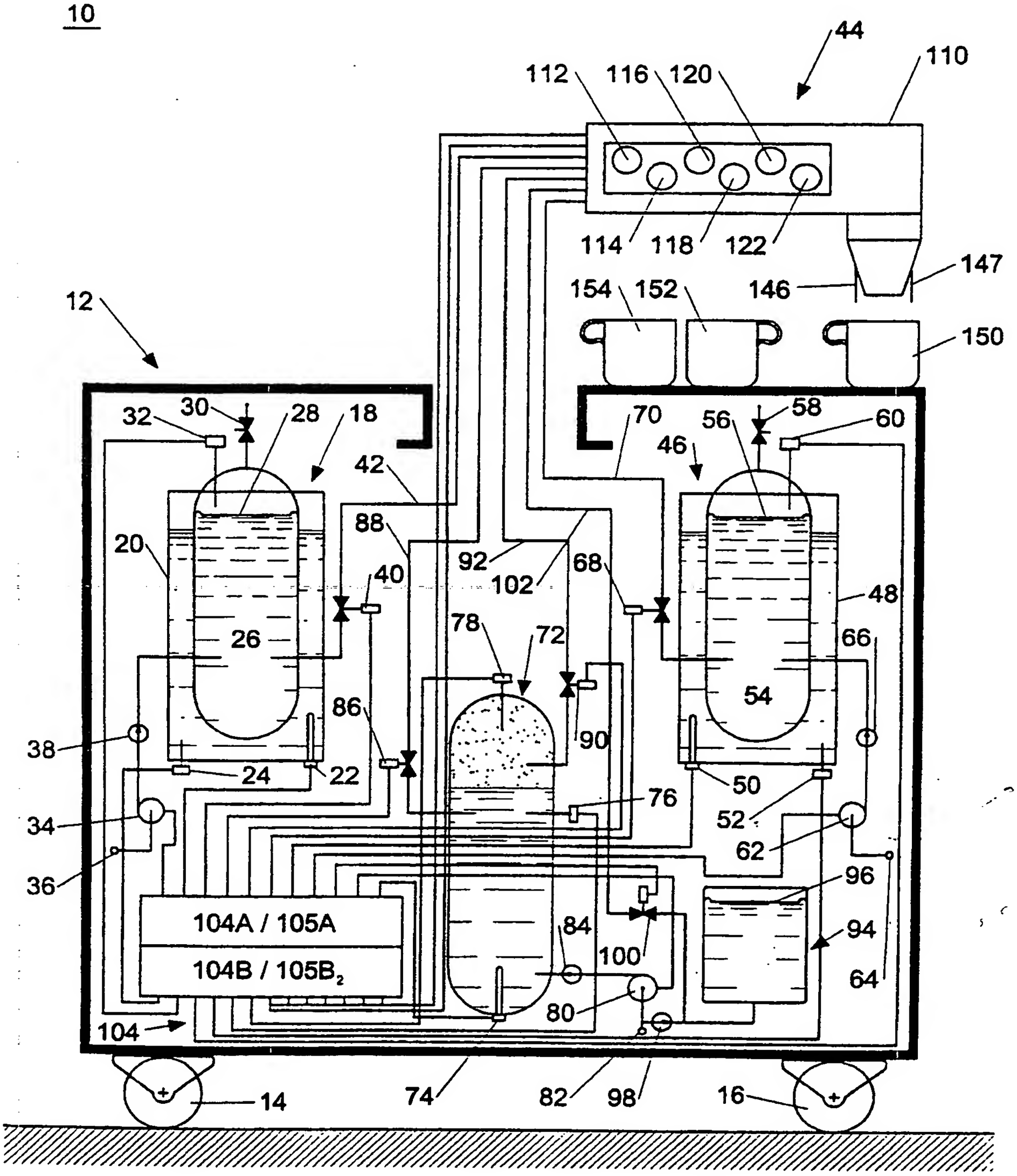
18. Apparatus, as in claims 3, 5 and 7, characterized in that the choose of the kind of beverage and a liquid level signal (S') in cup, determined by probes (146, 147) of a level sensor (142), are sent to a microprocessor (250_2) enabling the activation of electrovlaves (40, 86, 90, 100, 68 and 132) till reaching the wanted liquid level in cup determined by the probes (146, 147).

19. Apparatus as in preceding claims, characterized in that to the tanks for hot coffee (18), for hot milk (46) and to the boiler (72) for hot water and steam can be added a tank for hot tea provided with thermostat, pressure switch, supply duct and electrovalve and that the supply gun (44, 44a) is provided with at least one additional push-button to supply hot tea.

20. Apparatus, as in claim 19, characterized in that the supply gun (44, 44a) is provided with two additional push-buttons, one for supplying just tea and the other for supplying tea with addition of hot milk.

21. Apparatus, as in claim 20, characterized by containing a logic taking into account the presence of the hot tea tank and the push-buttons for supplying just hot tea and tea with milk, respecively.

22. Apparatus as in preceding claims, characterized by having been mounted on a truck (12), movable on wheels (14, 16) for carriage to the use place.


10
12
44
110
112
116
120
114
118
122
147
154
152
146
150
32
30
28
18
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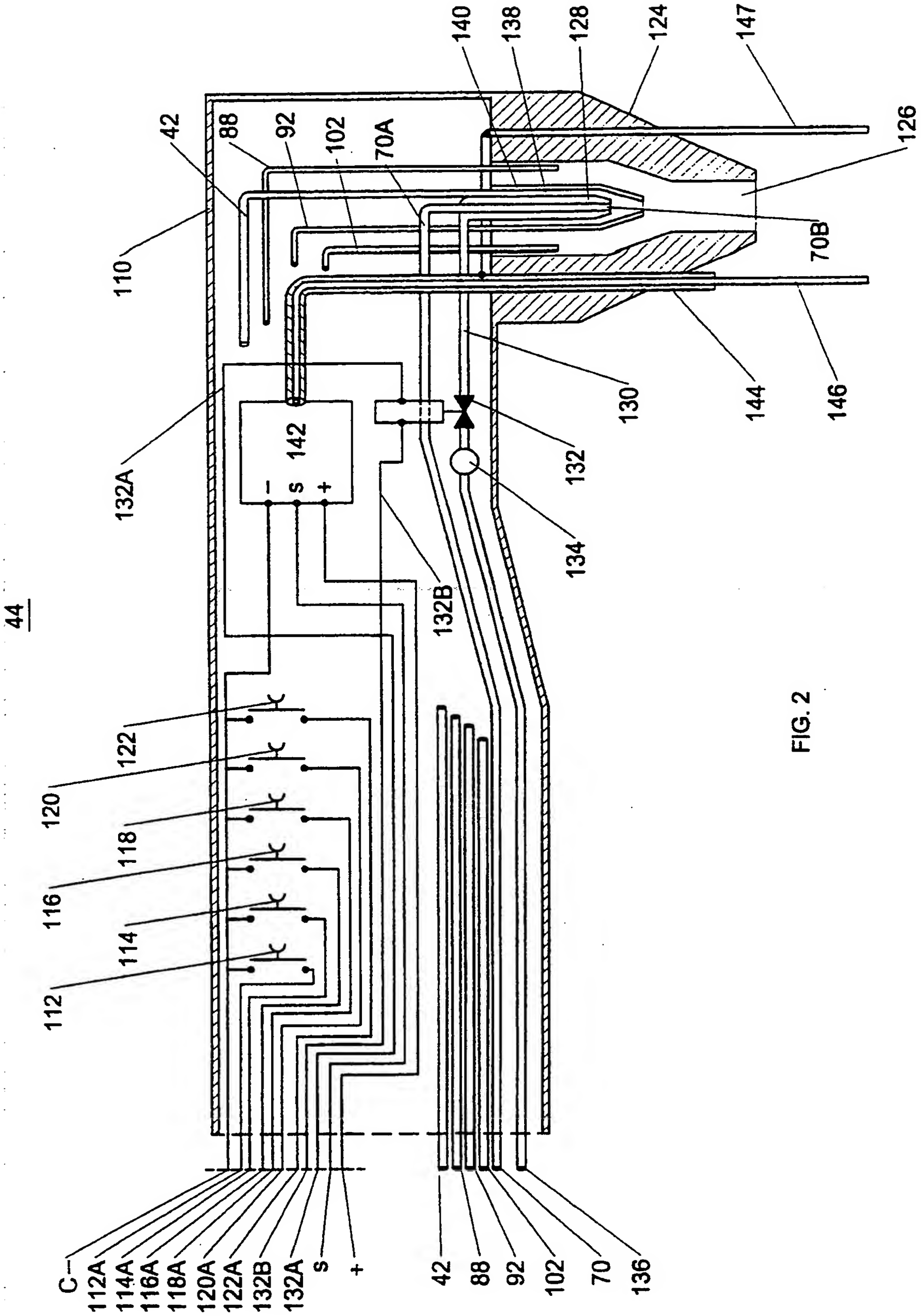
56
58
60
46
42
88
92
102
68
20
40
48
78
72
66
26
54
86
90
38
24
22
50
76
52
34
62
36
96
104A / 105A
104B / 105B2
84
100
94
64
80
104
14
74
82
98
16

FIG. 1


44
140
138
128
124
147
126
42
88
92
102
70A
110
70B
132A
142
S
132
130
144
146
134
132B
122
120
118
116
114
112
C
112A
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132B
132A
S
+
42
88
92
102
70
136

FIG. 2

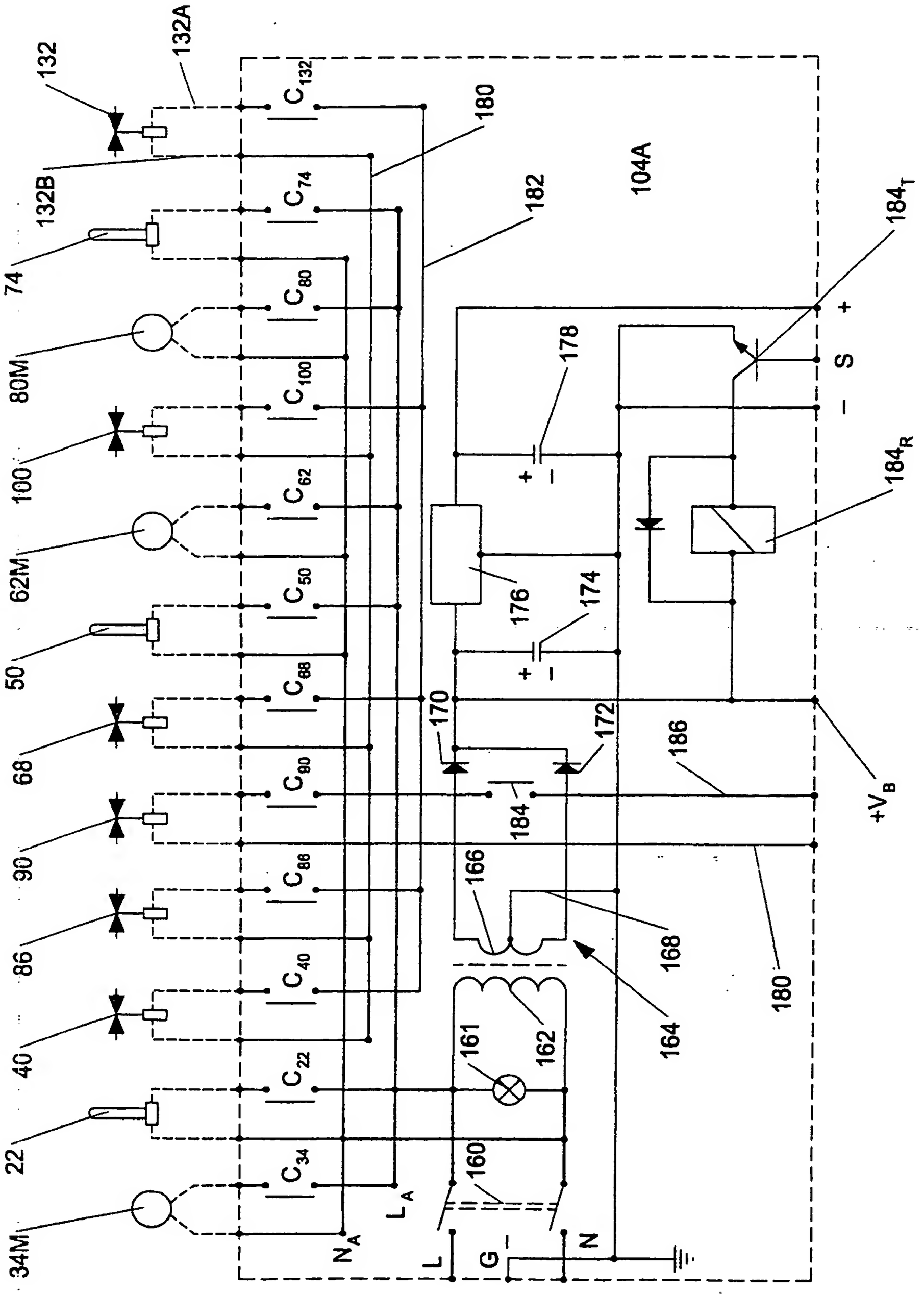
132
132A
132B
74
80M
100
62M
50
68
90
86
40
22
34M
C_{132}
C_{74}
C_{80}
C_{100}
C_{62}
C_{50}
C_{88}
C_{90}
C_{86}
C_{40}
C_{22}
C_{34}
180
182
104A
178
176
174
170
172
186
184
166
168
180
161
162
164
160
184_T
184_R
S +
–
+
–
$+V_B$
N_A
L_A
L
G
N

FIG. 3

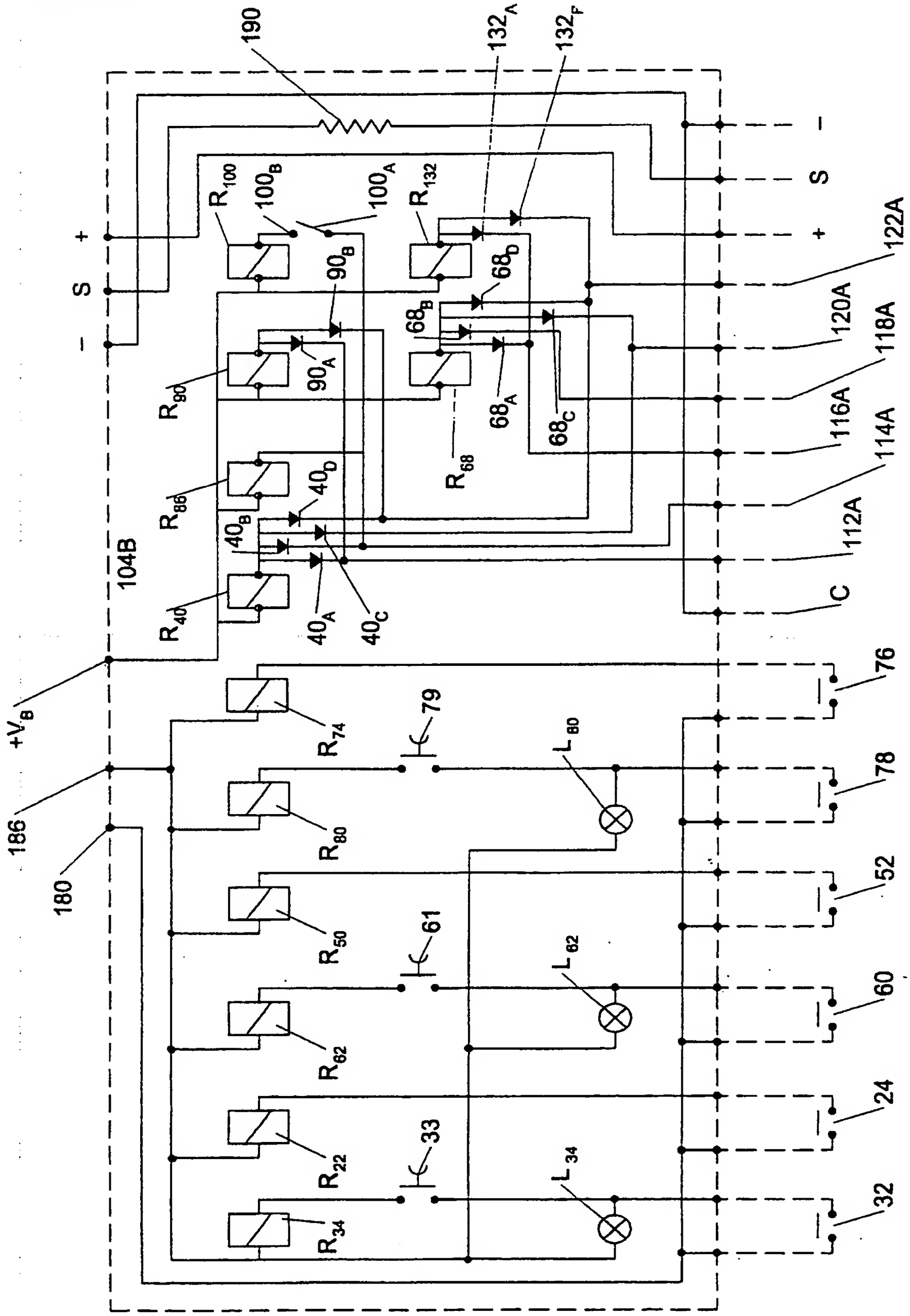
190
132A
132F
S +
S −
122A
120A
118A
116A
114A
112A
C
R100
100B
100A
R132
90B
68D
68B
68C
68A
90A
R90
R68
R86
40D
40B
40A
40C
R40
104B
+VB
186
180
R74
79
L80
76
R80
78
R50
61
L62
52
60
R62
R22
33
L34
24
R34
32

FIG. 4

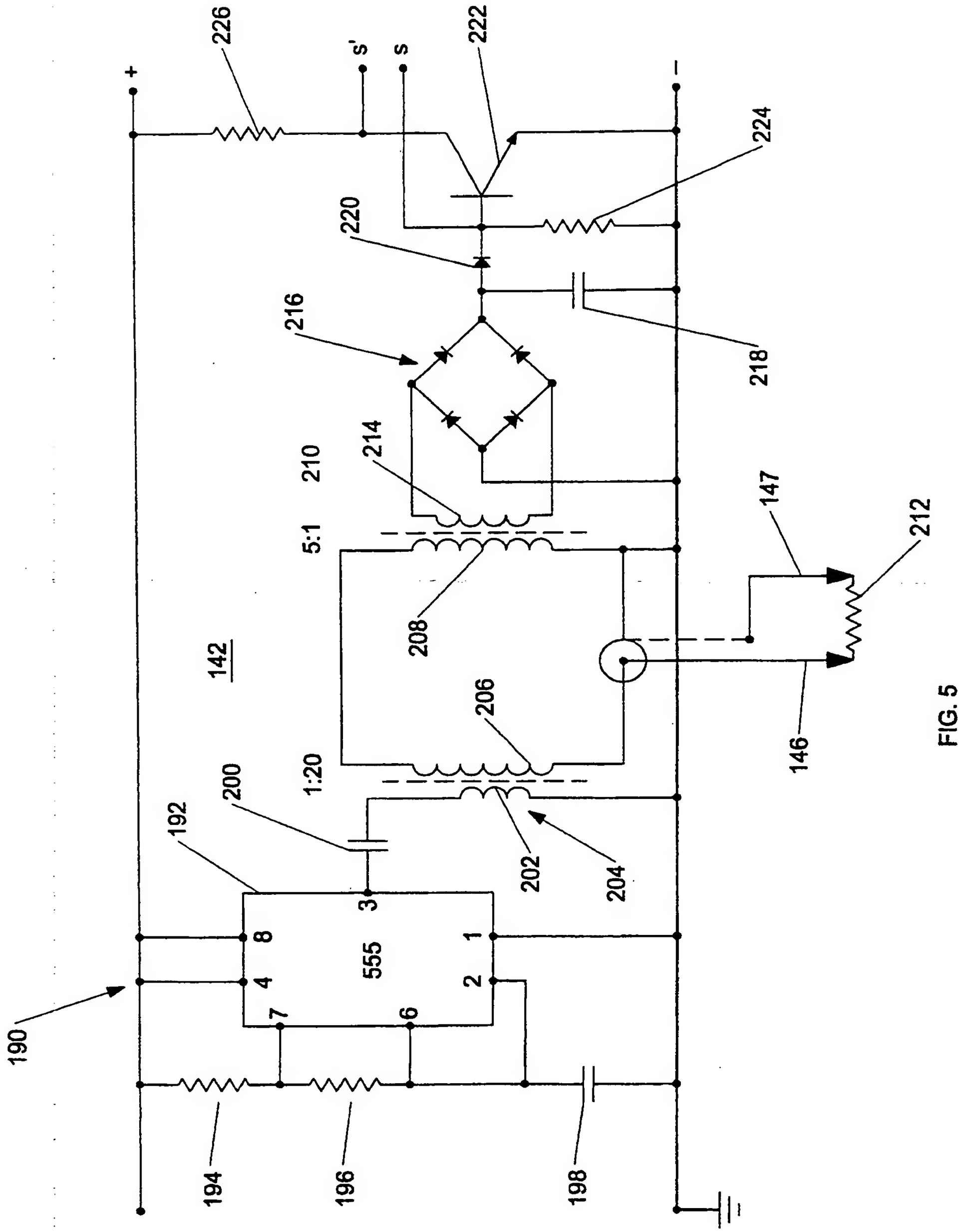
+
226
S'
S
222
-
224
220
216
218
214
210
5:1
208
142
206
1:20
200
192
202
204
147
212
146
190
8
4
7
555
6
1
2
3
194
196
198

FIG. 5

10a

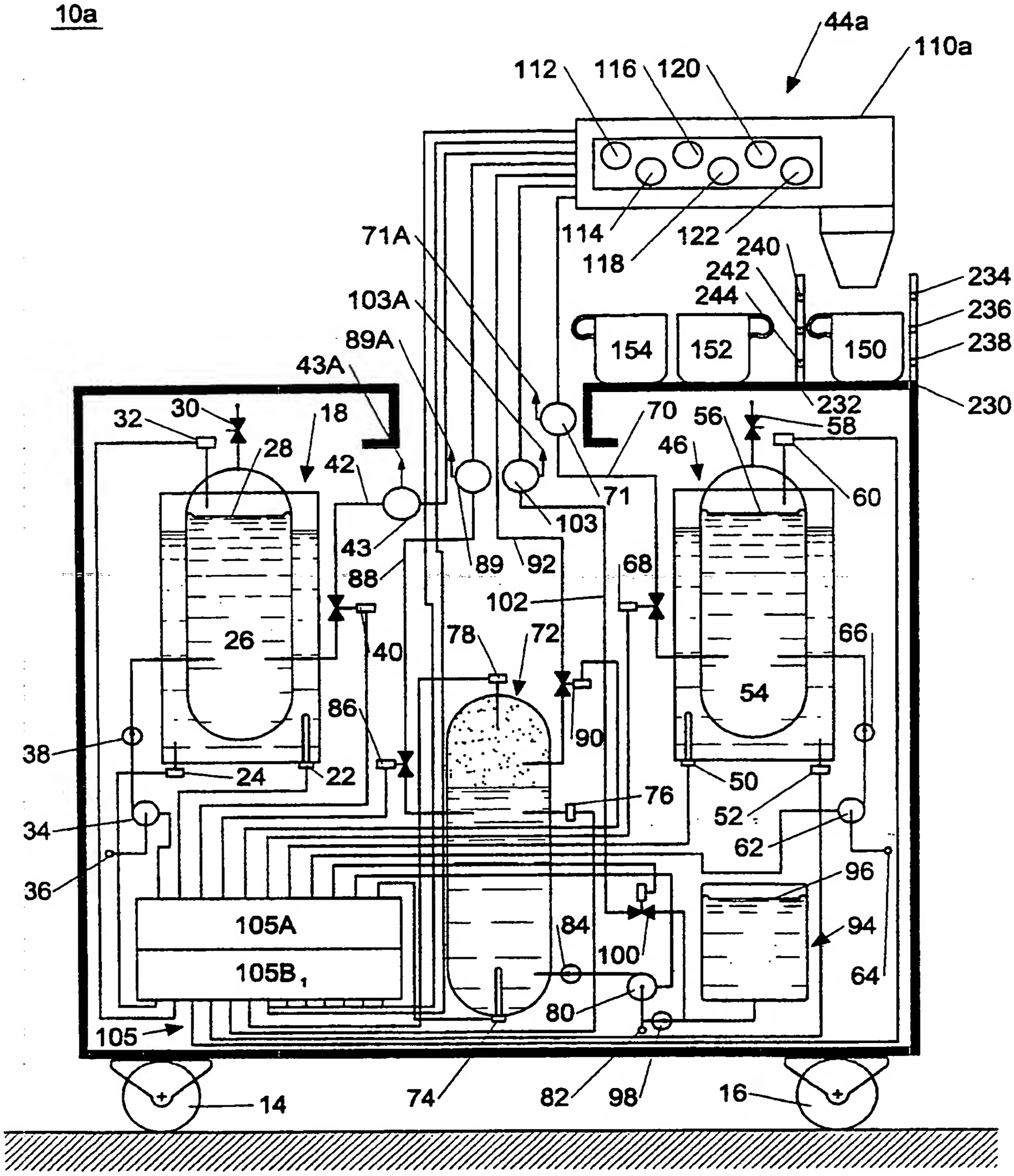
44a
110a
112
116
120
114
118
122
71A
103A
89A
43A
240
242
244
234
236
238
230
232
154
152
150
70
56
58
46
60
32
30
18
28
42
71
103
43
89
92
88
68
102
26
40
78
72
66
54
86
90
38
24
22
50
76
52
34
62
36
96
105A
105B1
84
100
94
64
80
105
14
74
82
98
16

FIG. 6

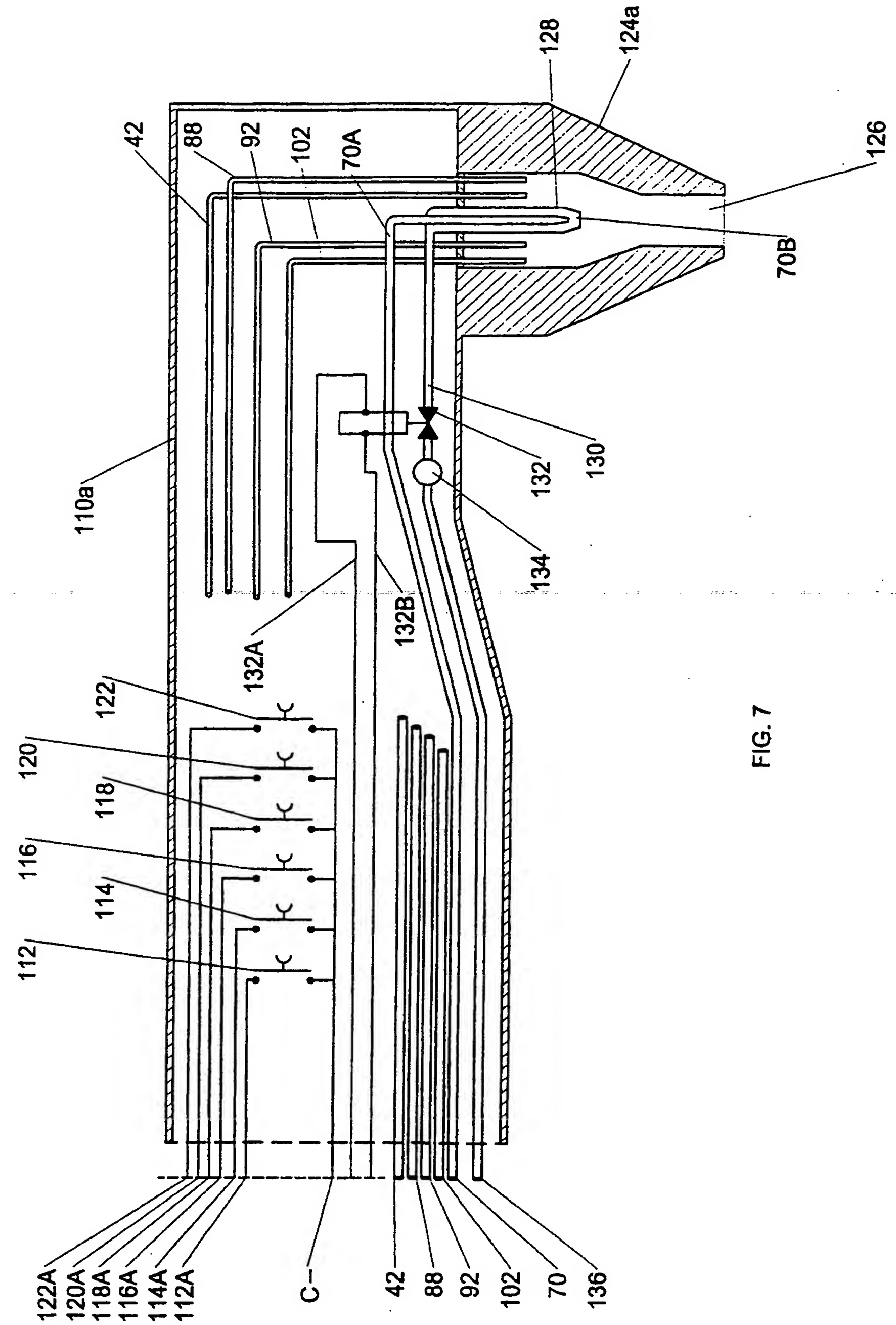
128
124a
126
42
88
92
102
70A
70B
110a
132
130
134
132B
132A
44a
122
120
118
116
114
112
122A
120A
118A
116A
114A
112A
C
42
88
92
102
70
136

FIG. 7

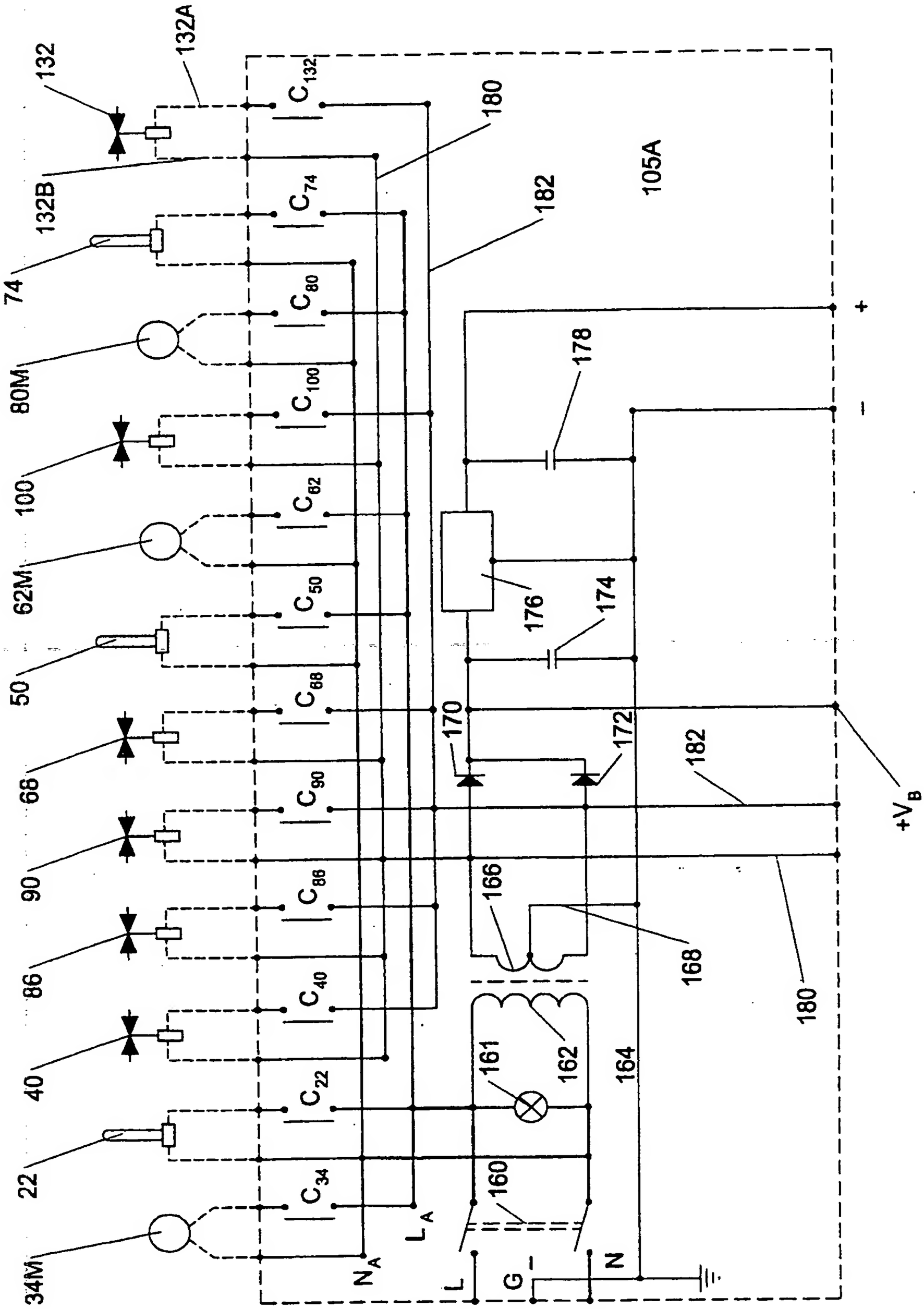
132
132A
132B
74
80M
100
62M
50
68
90
86
40
22
34M
C_{132}
C_{74}
C_{80}
C_{100}
C_{62}
C_{50}
C_{88}
C_{90}
C_{86}
C_{40}
C_{22}
C_{34}
180
182
105A
178
176
174
170
172
166
168
161
162
164
160
N_A
L_A
L
G
N
+
−
$+V_B$

FIG. 8

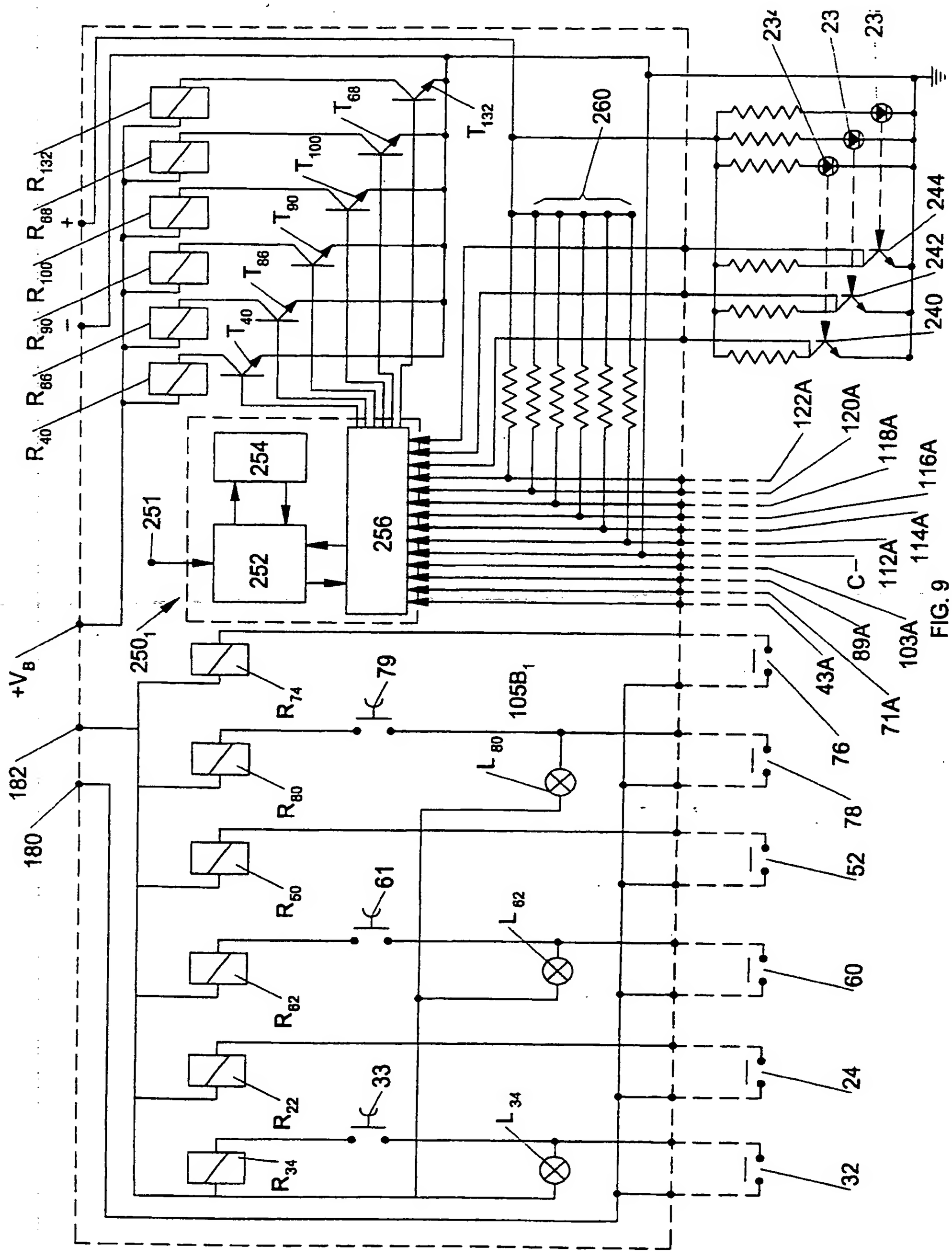
R_{132}
R_{88}
R_{100}
R_{90}
R_{66}
R_{40}
+
−
T_{68}
T_{132}
T_{100}
T_{90}
T_{86}
T_{40}
260
254
252
256
251
250_1
$+V_B$
182
180
R_{74}
79
$105B_1$
R_{80}
L_{80}
R_{60}
61
L_{82}
R_{62}
R_{22}
33
L_{34}
R_{34}
234
23
23_1
244
242
240
122A
120A
118A
116A
114A
112A
C−
103A
89A
71A
43A
76
78
52
60
24
32

FIG. 9

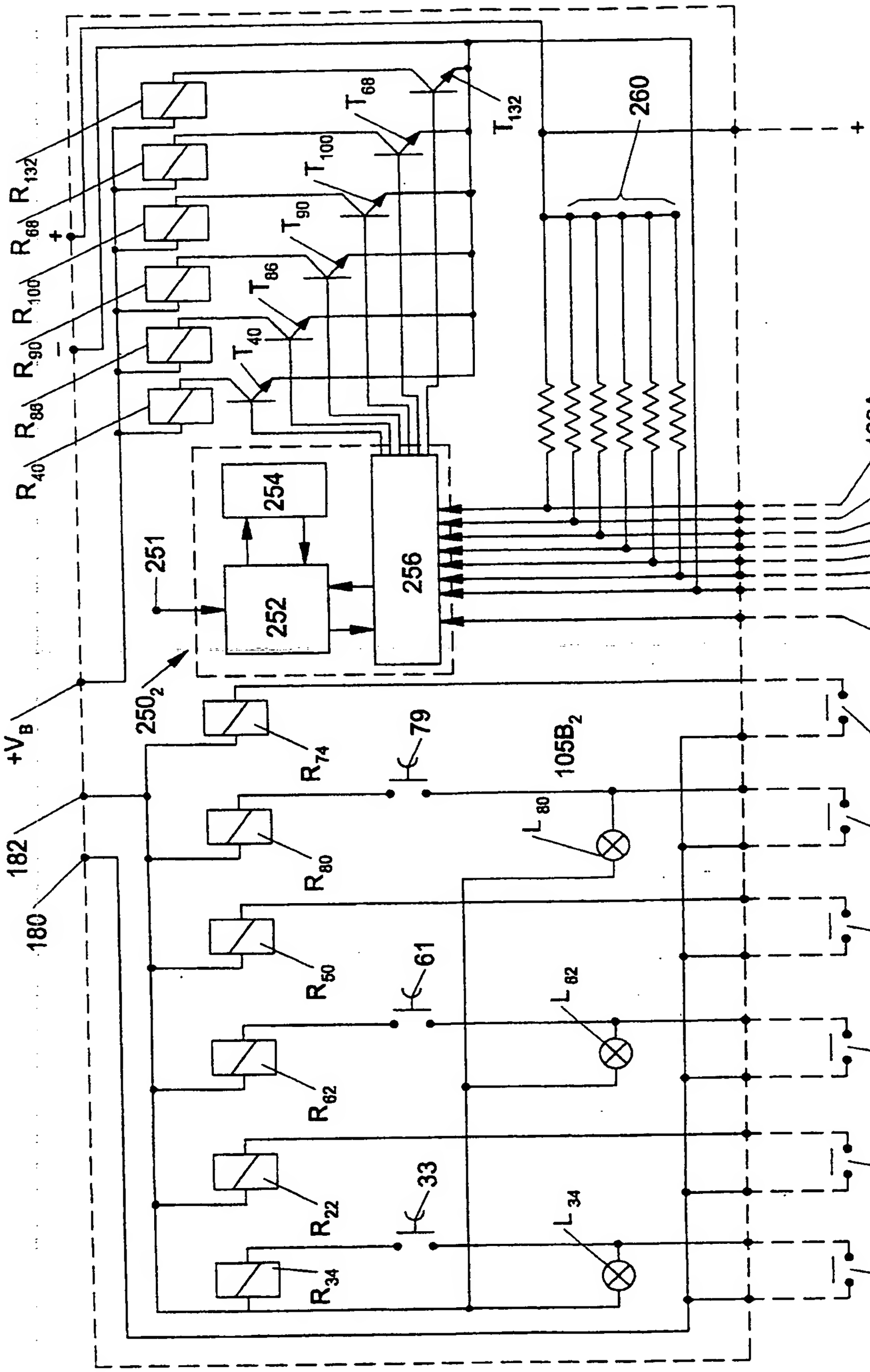
T_{68}
T_{132}
T_{100}
T_{90}
T_{86}
T_{40}
260
+
R_{132}
R_{68}
R_{100}
R_{90}
R_{86}
R_{40}
254
252
256
251
250_2
$+V_B$
R_{74}
79
$105B_2$
L_{80}
R_{80}
182
180
R_{50}
61
L_{82}
R_{62}
R_{22}
33
L_{34}
R_{34}
122A
120A
118A
116A
114A
112A
C–
S'
76
78
52
60
24
32

FIG. 10

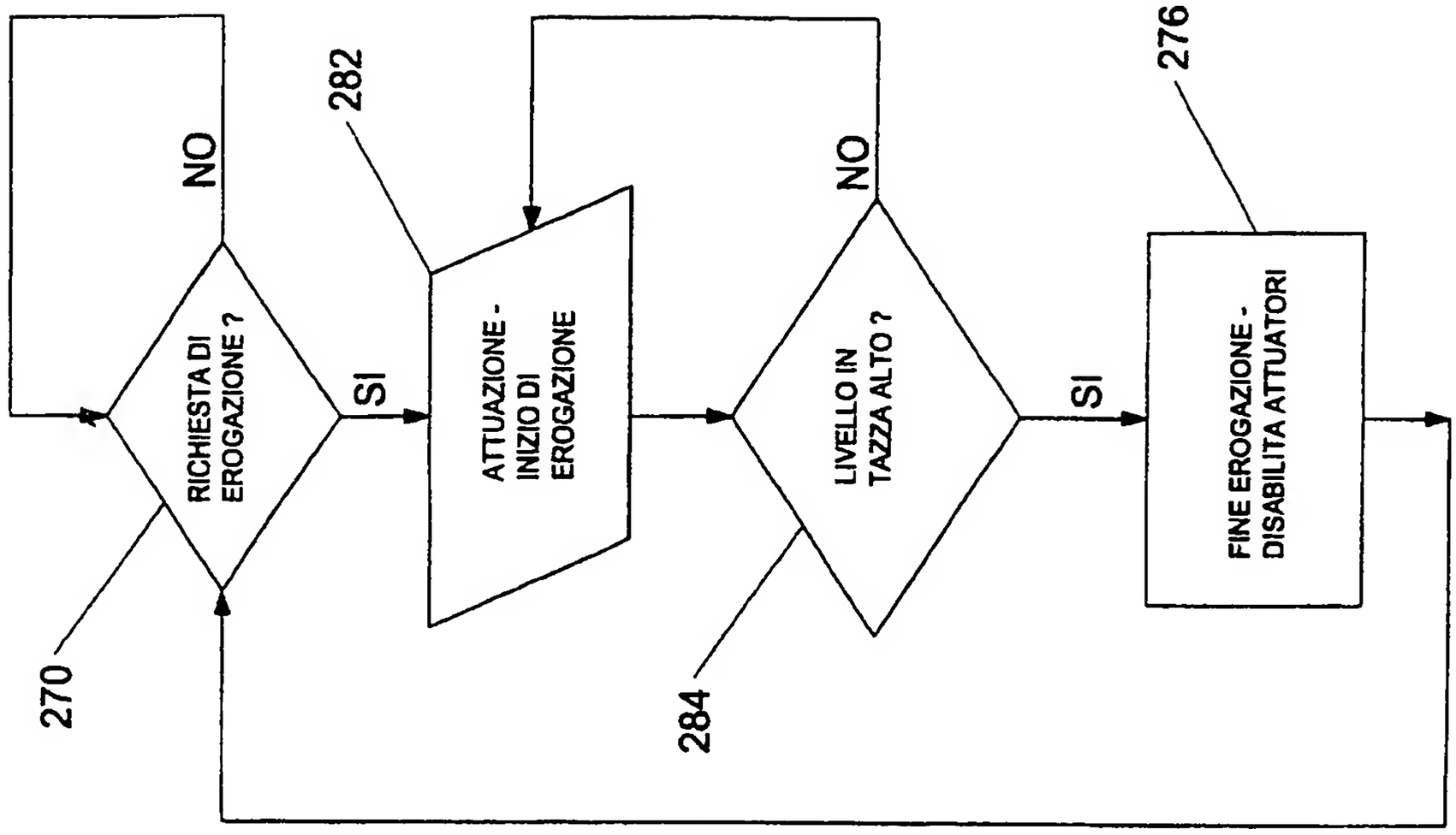
270
RICHIESTA DI EROGAZIONE ?
NO
SI
282
ATTUAZIONE - INIZIO DI EROGAZIONE
LIVELLO IN TAZZA ALTO ?
NO
SI
276
FINE EROGAZIONE - DISABILITA ATTUATORI
284

FIG. 12

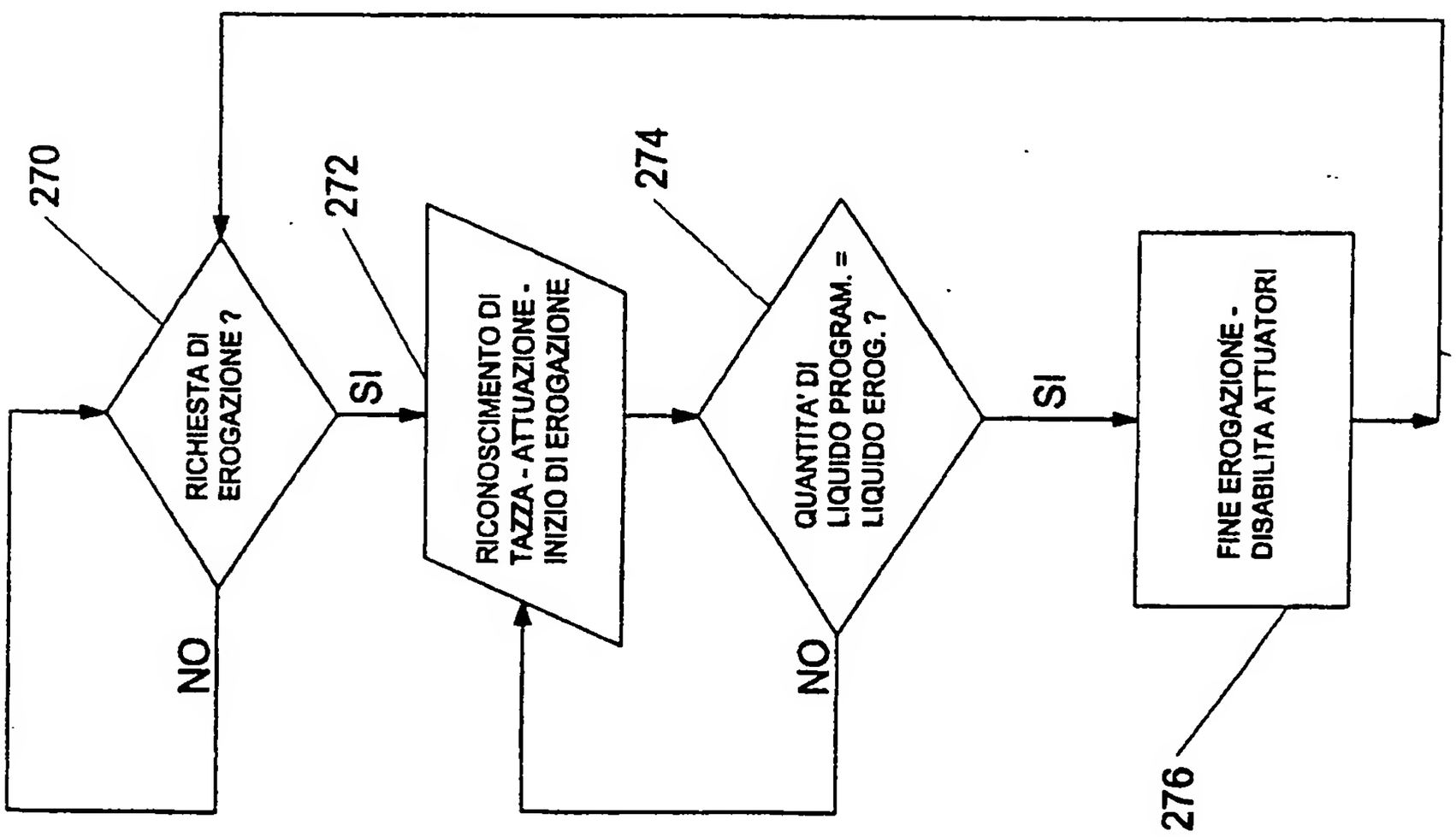
270
RICHIESTA DI EROGAZIONE ?
NO
SI
272
RICONOSCIMENTO DI TAZZA - ATTUAZIONE - INIZIO DI EROGAZIONE
274
QUANTITA' DI LIQUIDO PROGRAM. = LIQUIDO EROG. ?
NO
SI
276
FINE EROGAZIONE - DISABILITA ATTUATORI

FIG. 11

INTERNATIONAL SEARCH REPORT

In tional Application No
PCT/IT 01/00163

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A47J31/00 A47J31/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A47J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
WPI Data, EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 972 481 A (THERMOPLAN AG) 19 January 2000 (2000-01-19) column 2, line 6 -column 5, line 12; claims 1,2,7,8; figures 1,2,6 ---	1,5-7, 11, 13-17, 19-21
A	CH 685 597 A (THERMOPLAN AG) 31 August 1995 (1995-08-31) column 2, line 14 -column 4, line 60; figures ---	1,6,7,9, 10
A	US 5 158 793 A (HELBLING) 27 October 1992 (1992-10-27) column 6, line 3 -column 12, line 16; figures -----	1,3,5, 11,13, 15-18

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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°O° document referring to an oral disclosure, use, exhibition or other means

°P° document published prior to the international filing date but later than the priority date claimed

°T° later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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°Y° document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

°&° document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 July 2001	25/07/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Bodart, P

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Int ..tional Application No
PCT/IT 01/00163

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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CH 685597 A	31-08-1995	NONE	
US 5158793 A	27-10-1992	US 4858523 A	22-08-1989
		US 4967648 A	06-11-1990
		US 5080008 A	14-01-1992
		US 5072660 A	17-12-1991